

REMARKS

The specification and claims have been amended in order to correct obvious grammatical, idiomatic and typographical errors contained therein. No new matter has been added.

In order to more particularly point out and distinctly claim the subject matter Applicants regard as the invention, Claims 8 and 9 have been added. Claims 8 and 9 are in Jepson format and are directed to a grease composition for lubricating bearings of spindle motors employed in peripheral information devices in which the improvement comprises the grease composition being a method of lubricating bearings of Claim 9 is directed to a method of lubricating devices in spindle motors employed in peripheral information devices in which the improvement comprises a step of lubricating the bearings with the grease composition of Claim 1. No new matter has been added.

In response to the Examiner's rejection of Claim 7 under 35 USC 112, first paragraph, Claim 7 has been canceled.

Claims 1-7 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 6-8 and 27 of co-pending application Serial No. 09/349 465. Claims 1-7 also have been rejected under 35 USC 103(a) as being unpatentable over Morway et al combined with Doner et al or Tanaka et al and Denton. Applicants respectfully traverse these grounds of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a grease composition which has a particular suitability for use with lubricating bearings contained in spindle motors employed in peripheral information devices such as hard disk drives, floppy disk drive memories, compact disk drives, magneto-optical disk drive systems, etc., found in computer systems and video tape recorders. As discussed in the present specification, in these types of information devices, there is a problem of gaseous oil or fine particles of a lubricating

grease scattering from the inside of a bearing during the operation thereof to cause contamination inside the device resulting in the malfunction thereof.

Another problem associated with these types of devices is a phenomenon called fretting. Fretting occurs when ball bearings used in information devices undergo vibration at a low frequency of about 5-10 Hz during operation of the information devices and can cause the race faces in contact with balls inside a bearing to suffer damage and degrade. Fretting not only degrades the acoustic characteristics of the ball bearing but also adversely influences the performance of the information device.

The present invention was arrived at in order to provide a grease composition for bearings of information devices which not only suppresses the amount of oil or grease which scatters from the bearing, it also has a preventative effect with respect to fretting.

The carbonate grease used in the present invention requires that the alkyl groups provided therein are distributed concentrically in the range of from 13-15 carbon atoms with the express aim of providing a carbonate composition having improved evaporation and friction torque characteristics. It was completely surprising to the present inventors to discover that the combination of the specifically claimed carbonate and molybdenum dithiophosphate and/or molybdenum dithiocarbamate resulted in a grease composition which exhibited excellent fretting resistance when used in information devices. As such, each of the claimed components are critical in the claimed invention and are clearly not obvious in light of the prior art cited by the Examiner and patentably distinguish the presently claimed invention thereover.

U.S. Serial No. 09/349 465 is directed to grease compositions containing a carbonate base oil and alkaline metal salts and/or alkaline earth metal salt thickeners. As stated by the Examiner, this reference does disclose that a

usual additive can be present in the grease composition. However, this reference does not specifically disclose molybdenum dithiophosphate and/or molybdenum dithiocarbamate being present or that a grease composition having superior properties when used for lubricating bearings of spindle motors employed in peripheral information devices would be arrived at if the molybdenum compounds were added thereto. As such, it is respectfully submitted that the presently claimed invention is unobvious in view of Claims 6-8 and 27 of U.S. application No. 09/349 465.

The Morway et al reference discloses synthetic lubricants which can comprise organic carbonates having hydrocarbon radicals with at least eight carbon atoms. If the carbonate used in Morway et al was as disclosed in the Table in Column 3, there are seven structural isomers having eight carbon atoms and the rate of mixture thereof ranges from 29% to 1.4%. This means an enumerable amount of structural isomers having from 8-20 carbon atoms and having varying properties of boiling point and viscosity which range from very low to very high values. If the carbonate compound of Morway et al was employed as a lubricant for bearings of spindle motors as required by the present invention, a carbonate having a low viscosity would be scattered onto a surface of a hard disk, which operates at about 90°C, and a carbonate having a low boiling point would evaporate and be absorbed to damage the hard disk and deteriorate the operation of the peripheral information device. Therefore, the nonhomogeneous greases of Morway et al could not be used as greases for information devices as intended in the present application.

The Doner et al and Tanaka et al references have been cited by the Examiner as teaching the use of molybdenum dithiocarbamate and molybdenum dithiophosphate as convention enhancing additives in grease compositions. However, there is no disclosure in this reference that combining the molybdenum compounds disclosed there in a grease composition containing

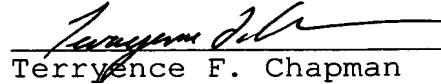
the claimed carbonate would result in a grease composition having superior properties when used for lubricating bearings contained in peripheral information devices. Therefore, Applicants respectfully submit that the naked disclosure of the claimed molybdenum compound does not suggest, in combination with the primary Morway et al reference, that the superior grease composition of the present invention would result from combining the claimed carbonate with the claimed molybdenum compounds. Therefore, Applicants respectfully submit that the presently claimed invention is patentably distinguishable over Morway et al combined with Doner et al or Tanaka et al.

The Denton et al reference teaches that the sealing of a bearing containing a grease is generally practiced. However, in contrast thereto, bearings used in information devices generally are not sealed. This is because if the bearing was sealed, not only would the cost increase, but the number of parts would also increase which would lead to an increase in weight. As such, in information devices, it is preferable to dispense with the sealing of the bearing. Therefore, Denton in combination with the previously cited references, does not negate the patentability of the presently claimed invention.

As an indication of the unobviousness of the presently claimed invention, Applicants wish to point out that the grease composition of the present invention is used in numerous computer manufacturers in Japan and a large number of products utilize the claimed grease composition. Moreover, as shown by the Examples and Comparative Examples contained in the present specification, the grease compositions of the present invention clearly exhibit superior properties over the comparative grease compositions which fall within the disclosure of the prior art.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,


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Encl: Marked-Up and Clean Amended Paragraph from Page 2
Marked-Up and Clean Amended Paragraph from Page 11
Marked-Up and Clean Amended Claims 1-3
New Claims 8 and 9
Postal Card

136.9803

Marked-Up Amended Paragraph
beginning on line 12 and
ending on line 14 of Page 2
OPS Case 498

June 13, 2001
U.S. Serial No. 09/625 148

When fretting takes place, the acoustic characteristics of the ball bearing not only are worsened, ~~but~~it also adversely influences the performance of the information device. |

Clean Amended Paragraph
beginning on line 12 and
ending on line 14 of Page 2
OPS Case 498

June 13, 2001
U.S. Serial No. 09/625 148

When fretting takes place, the acoustic characteristics of the ball bearing not only are worsened, it also adversely influences the performance of the information device.

Marked-Up Amended Paragraph
beginning on line 20 and
ending on line 24 of Page 11
OPS Case 498

June 13, 2001
U.S. Serial No. 09/625 148

The motor characteristic test was performed such that a bearing, in which a grease composition to be tested was sealed, ~~was~~ assembled in a spindle motor, and the motor ~~was~~ rotated at normal temperatures at 5,400 r.p.m. ⁷ to measure noises, ~~an~~ amount of ~~a~~ grease evaporated (scattered), and ~~a~~ torque of rotations.

Clean Amended Paragraph
beginning on line 20 and
ending on line 24 of Page 11
OPS Case 498

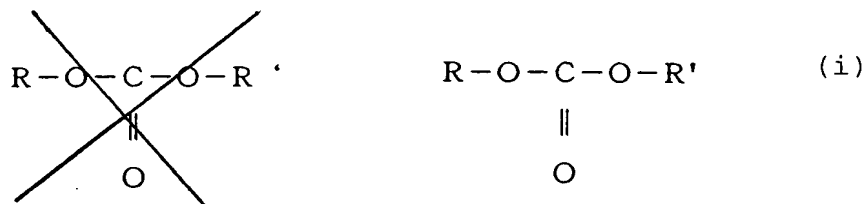
June 13, 2001
U.S. Serial No. 09/625 148

The motor characteristic test was performed such that a bearing, in which a grease composition to be tested was sealed, assembled in a spindle motor, and the motor rotated at normal temperatures at 5,400 r.p.m. to measure noises, amount of grease evaporated (scattered), and torque of rotations.



1. (Amended) A grease composition for a bearing of information devices comprising:

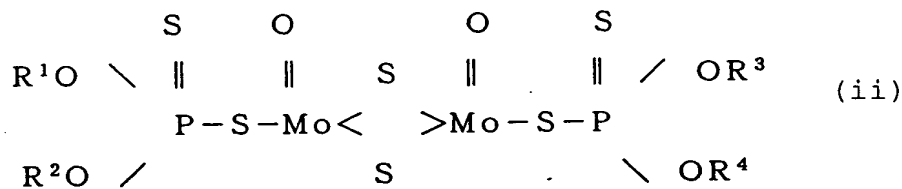
a carbonate compound of the following general formula (i) serving as a base oil



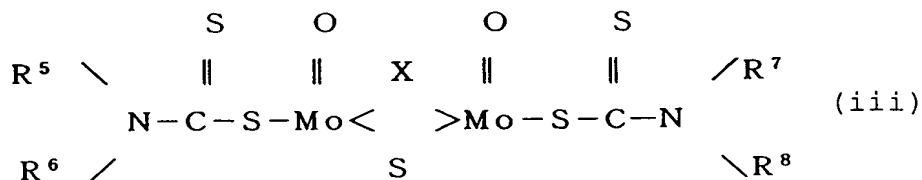
wherein R and R' may be the same or different and independently represent a branched alkyl group having from 13 to 15 carbon atoms;

a lithium soap serving as a thickener; and

at least one organomolybdenum compound selected from the group consisting of a molybdenum dithiophosphate of the general formula (ii)

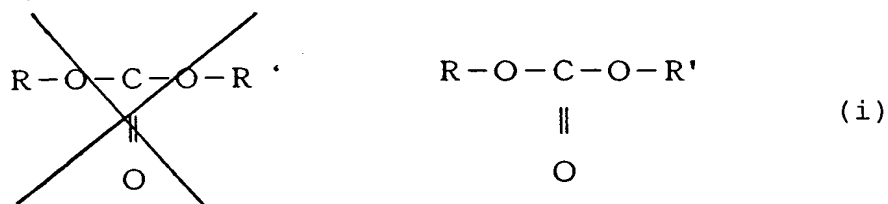


wherein R¹, R², R³ and R⁴ independently represent an alkyl group having from 1 to 24 carbon atoms or an aryl group having from 6 to 30 carbon atoms, and a molybdenum dithiocarbamate of the general formula (iii)

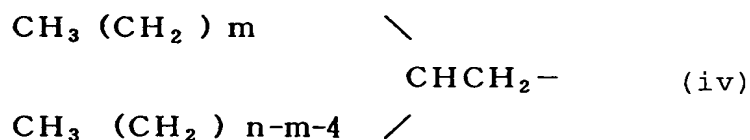


wherein R^5 , R^6 , R^7 and R^8 independently represent an alkyl group having from 1 to 24 carbon atoms, and X represents O or S.

2. (Amended) The grease composition as recited in Claim 1, wherein the base oil is made of a carbonate compound of the following general formula (i)

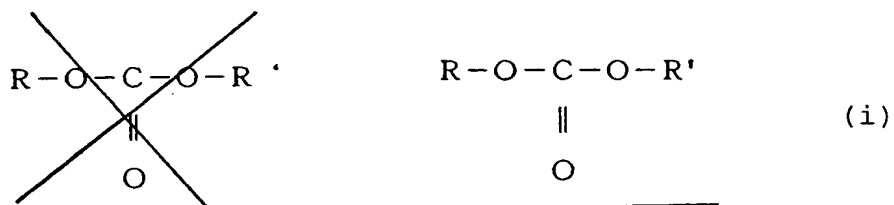


wherein R and R' may be the same or different and independently represent a branched alkyl group of the following general formula (iv)



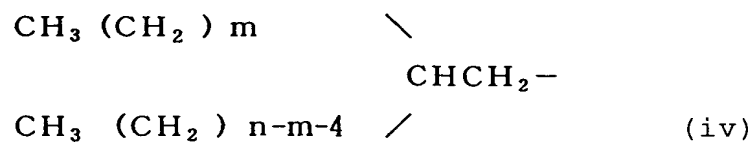
wherein $n = 13$ to 15 and $m = 0$ to 6 .

3. (Amended) A grease composition for a bearing of information devices which comprises 70 to 95 parts by weight of a carbonate compound of the general formula (i)



wherein R and R' may be the same or different and

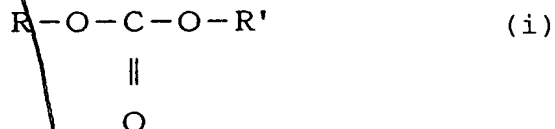
independently represent a branched alkyl group of the following general formula (iv)



wherein $n = 13$ to 15 and $m = 0$ to 6 , and 5 to 30 parts by weight of a lithium soap.

1. (Amended) A grease composition for a bearing of information devices comprising:

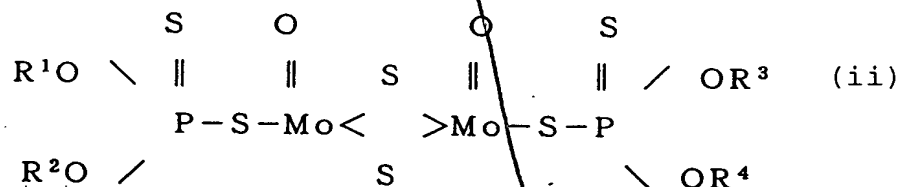
a carbonate compound of the following general formula (i) serving as a base oil



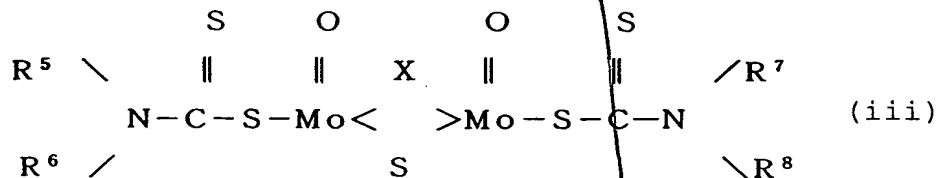
wherein R and R' may be the same or different and independently represent a branched alkyl group having from 13 to 15 carbon atoms;

a lithium soap serving as a thickener; and

at least one organomolybdenum compound selected from the group consisting of a molybdenum dithiophosphate of the general formula (ii)

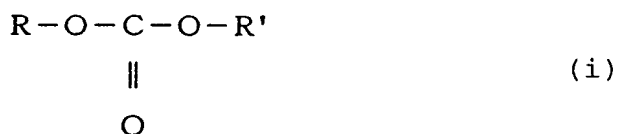


wherein R¹, R², R³ and R⁴ independently represent an alkyl group having from 1 to 24 carbon atoms or an aryl group having from 6 to 30 carbon atoms, and a molybdenum dithiocarbamate of the general formula (iii)

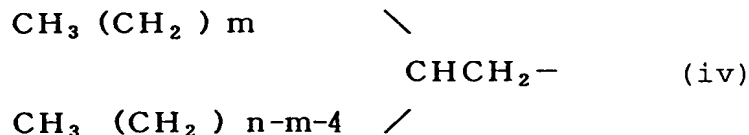


wherein R⁵, R⁶, R⁷ and R⁸ independently represent an alkyl group having from 1 to 24 carbon atoms, and X represents O or S.

2. (Amended) The grease composition as recited in Claim 1, wherein the base oil is made of a carbonate compound of the following general formula (i)



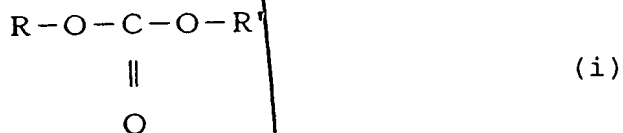
wherein R and R' may be the same or different and independently represent a branched alkyl group of the following general formula (iv)



wherein n = 13 to 15 and m = 0 to 6.

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3. (Amended) A grease composition for a bearing of information devices which comprises 70 to 95 parts by weight of a carbonate compound of the general formula (i)



wherein R and R' may be the same or different and independently represent a branched alkyl group of the following general formula (iv)

CH₃ (CH₂)_m

CHCH₂-

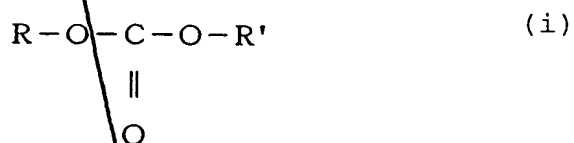
CH₃ (CH₂)_{n-m-4}

(iv)

wherein n = 13 to 15 and m = 0 to 6, and 5 to 30 parts by weight of a lithium soap.

8. (New) A grease composition for lubricating bearings of spindle motors employed in peripheral information devices in which the improvement comprises said grease composition containing:

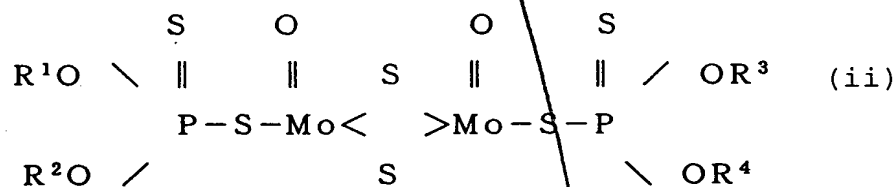
a carbonate compound of the following general formula (i) serving as a base oil



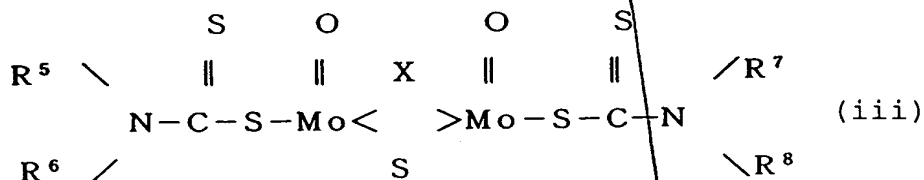
wherein R and R' may be the same or different and independently represent a branched alkyl group having from 13 to 15 carbon atoms;

a lithium soap serving as a thickener; and

at least one organomolybdenum compound selected from the group consisting of a molybdenum dithiophosphate of the general formula (ii)



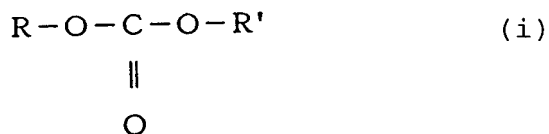
wherein R¹, R², R³ and R⁴ independently represent an alkyl group having from 1 to 24 carbon atoms or an aryl group having from 6 to 30 carbon atoms, and a molybdenum dithiocarbamate of the general formula (iii)



wherein R⁵, R⁶, R⁷ and R⁸ independently represent an alkyl group having from 1 to 24 carbon atoms, and X represents O or S.

9. (New) A method of lubricating bearings of spindle motors employed in peripheral information devices in which the improvement comprises a step of lubricating said bearings with a grease composition containing:

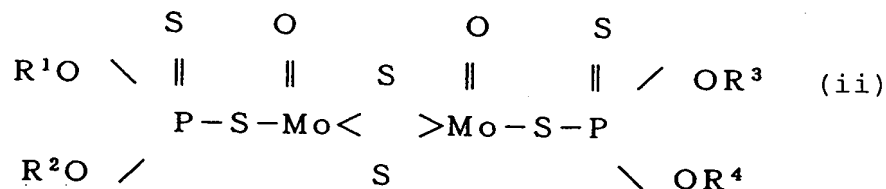
a carbonate compound of the following general formula (i) serving as a base oil



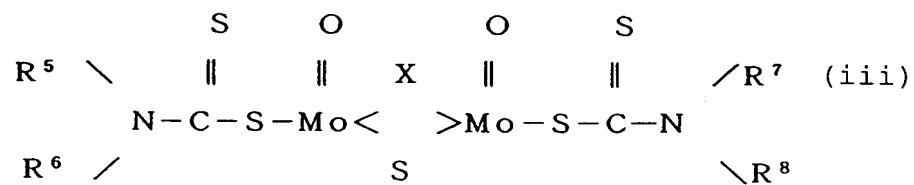
wherein R and R' may be the same or different and independently represent a branched alkyl group having from 13 to 15 carbon atoms;

a lithium soap serving as a thickener; and

at least one organomolybdenum compound selected from the group consisting of a molybdenum dithiophosphate of the general formula (ii)



wherein R¹, R², R³ and R⁴ independently represent an alkyl group having from 1 to 24 carbon atoms or an aryl group having from 6 to 30 carbon atoms, and a molybdenum dithiocarbamate of the general formula (iii)



A2 wherein R⁵, R⁶, R⁷ and R⁸ independently represent an alkyl group having from 1 to 24 carbon atoms, and X represents O or S.
